Year 10 Maths Overview

		HT1 **USING NUMBER**	HT2 **GEOMETRY** **DEVELOPING ALGEBRA**	HT3 **DEVELOPING ALGEBRA** **GEOMETRY**	HT4 **GEOMETRY** **PROPORTIONS AND PROPORTIONAL CHANGE**	HT5 **PROPORTIONS AND PROPORTIONAL CHANGE** **PROBABILITY**	HT6 **DELVING INTO DATA** **USING NUMBER**
Learning outcomes/composite knowledge: Pupils will be able to…		**LO1: Calculations and Accuracy** To revisit and secure number fluency **LO2: Fractions, Decimals and Percentages** To understand equivalence and to solve problems involving fractions, decimals and percentages **LO3: Measures** To revisit and solve problem using different units	**LO1 Congruence, Similarity and Enlargement** To determine and implement congruence, similarity and enlargement strategies **LO2: Trigonometry** To understand and use trigonometry **LO3: Representing Solutions of Equations and Inequalities** To develop algebraic understanding of equations and inequalities	**LO1: Simultaneous Equations** To use algebraic skills to work with simultaneous equations **LO2: Angles and Bearings** To use angle knowledge to calculate with angles and bearings	**LO1: Working with Circles** To build upon prior knowledge to work with circles **LO2: Ratio and Fractions** To calculate and problem solve with ratios and fractions	**LO1: Percentages and Interest** To understand and use percentages and interest effectively **LO2: Probability** To understand and work with probability	**LO1: Collecting, Representing and Interpreting Data** To further knowledge of statistics **LO2: Non-calculator Methods** To calculate using non-calculator methods
Knowledge Components	Declarative Knowledge:	**LO1: Calculations and Accuracy** • I know understand place value • I know what inverse means • I know what the order of operations is • I know what rounding is • I know what significant figures are • I know what inequalities are **LO2: Fractions, Decimals and Percentages** • I know what equivalent means • I know what per cent means **LO3: Measures** • I know what metric units are • I know what compound measures are • I know what a scale factor is • I know what similar means	**LO1 Congruence, Similarity and Enlargement** • I know what enlarge means • I know what a scale factor is • I understand the difference between congruence and similarity • I know the parallel line rules • I know the conditions for congruent triangles **LO2: Trigonometry** • I know what ratio is • I can identify the hypotenuse, opposite and adjacent sides • I know Pythagoras' Theorem **LO3: Representing Solutions of Equations and Inequalities** • I know what the meaning of a solution is • I know what an inequality is • I can interpret representation on number lines as inequalities	**LO1: Simultaneous Equations** • I know what an equation is • I know what a solution is • I understand that equations can have more than one solution • I know what simultaneous means • I know what substitute means • I know what a variable is **LO2: Angles and Bearings** • I understand cardinal direction notation • I know what a scale drawing is • I know what a bearing is • I know what the angle rules are • I know what Pythagoras and trigonometry are	**LO1: Working with Circles** • I know what the different parts of a circle are • I know what volume is • I know what surface area is • I know what similar means **LO2: Ratio and Fractions** • I know what ratios and fractions are • I know what scale means	**LO1: Percentages and Interest** • I know what fractions, decimals and percentages are • I know what scale means • I know the difference between simple and compound interest **LO2: Probability** • I know what the word probability means • I know that probabilities sum to 1 • I know the different ways of representing probability • I know what Venn diagrams and frequency trees are	**LO1: Collecting, Representing and Interpreting Data** • I know what the difference is between a population and a sample • I know what primary and secondary data is • I know what different types of tables, charts and diagrams are • I know what different types of averages are • I know what a line of best fit is **LO2: Non-calculator Methods** • I know the four rule of fraction arithmetic • I know what significant figures are • I know what estimate means

	Procedural Knowledge (methods)	**LO1: Calculations and Accuracy**
		• I know how to use the four operations with 2 and three digits
		• I know how to use the four operations with directed numbers
		• I know how to apply the correct order of operations
		• I know how to calculate money problems
		• I know how to round to a given number of decimal places
		• I know how to round to a given number of significant figures
		• I know how to use place value to calculate changes to calculations
		• I know how to use a calculator for complex calculations
		• I know how to find upper and lower bounds
		• I know how to estimate answers to calculations
		• I know how to use inequality notation to specify error intervals due to rounding
		
		LO2: Fractions, Decimals and Percentages
		• I know how to find equivalent fractions
		• I know how to simplify fractions
			LO1 Congruence, Similarity and Enlargement
			• I know how to enlarge a shape by a positive and fractional scale factor
			• I know how to identify similar shapes
			• I can work out missing sides and angles in a given pair of similar shapes
			• I can use parallel line rules to work out missing angles
			• I know how to establish is a pair of triangles are similar
			• I know how to use the conditions for congruent triangles
			
			LO2: Trigonometry
			• I can work fluently with the hypotenuse, opposite and adjacent sides
			• I kno0w how to use the tangent ratio to find missing side lengths
			• I know how to use the sine and cosine ratio to find missing side lengths
			• I know how to use the sine, cosine and tangent to find missing side lengths and angles
			• I know how to calculate sides in right-angled triangles using Pythagoras' Theorem
				LO1: Simultaneous Equations
				• I know how to determine whether a given (x, y) is a solution to a pair of linear simultaneous equations
				• I know how to solve a pair of linear simultaneous equations:
				  ○ By substituting a known variable
				  ○ By substituting an expression
				  ○ Using graphs
				  ○ By subtracting equations
				  ○ By adding equations
				  ○ By adjusting one equation
				  ○ By adjusting both equations
				• I know how to use a given equation to derive related facts
				• I know how to form and solve a pair of linear simultaneous equations from given information
				
				LO2: Angles and Bearings
				• I know how to use cardinal directions and related angles
				• I know how to draw and interpret scale diagrams
				• I understand and know how to represent bearings
					LO1: Working with Circles
					• I know how to label the different parts of a circle
					• I know how to calculate fractional parts of a circle
					• I know how to calculate the length of an arc
					• I know how to calculate the area of a sector
					• I know how to use the volume of a cylinder, cone and sphere
					• I know how to use the surface area of a cylinder, cone and sphere
					• I know how to solve area and volume problems involving similar shapes
					
					LO2: Ratio and Fractions
					• I know how to compare quantities using ratio
					• I know how to link ratios and fractions
					• I know how to share in a ratio
					• I know how to use ratios and fractions to make comparisons
					• I know how to link ratios and graphs
					• I know what increase and decrease means
					• I know how to solve problems with currency conversions
						LO1: Percentages and Interest
						• I know how to convert and compare fractions, decimals and percentages
						• I know how to work out percentages of amounts with and without a calculator
						• I know how to increase and decrease by a given percentage
						• I know how to express one number as a percentage of another
						• I know how to calculate simple and compound interest
						• I know how to calculate repeated percentage change
						• I know how to find the original value after a percentage change
						• I know how to solve problems involving growth and decay
						• I know how to solve problems involving percentages, ratios and fractions
						
						LO2: Probability
						• I know how to add, subtract and multiply fractions
						• I know how to find probabilities using equally likely outcomes
						• I know how to use the property that probabilities sum to 1
							LO1: Collecting, Representing and Interpreting Data
							• I know how to determine if data is primary or secondary
							• I know how to construct and interpret frequency tables and frequency polygons
							• I know how to construct and interpret:
							  ○ two-way tables
							  ○ line and bar charts (including composite bar charts)
							  ○ pie charts
							  ○ Time series graphs
							  ○ Stem-and-leaf diagrams
							  ○ Scatter graphs
							• I know how to criticise charts and graphs
							• I know how to find and interpret averages from a list and a table
							• I know how to compare distributions using charts and measures
							• I know how to draw a line of best fit
							• I understand extrapolation
							
							LO2: Non-calculator Methods
							• I know how to use mental and written methods of integer and decimal addition, subtraction, multiplication and division

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	• I know how to order decimals and fractions • I know how to calculate fractions of quantities • I know how to convert between fractions, decimals and percentages, • I know how to calculate percentages of quantities • I know how to add, subtract, multiply and divide fractions, • I know how to multiply and divide decimals • I know how to increase and decrease by a given percentage • I know how to compare fractions, decimals and percentages • I know how to calculate percentage change • I know how to calculate with mixed numbers • I know how to work out reverse percentage problems • I know how to work out compound interest and depreciation **LO3.Measures** • I know how to read scales • I know how to Interpret real-life tables • I know how to Convert one metric unit to another • I know how to solve simple speed problems • I know how to use compound measures such as speed and density • I know how to draw and interpret distance-time graphs • I know how to use ratio and scale factors to calculate missing lengths in similar shapes • I know how to calculate complex average speeds from distance-time graphs	• I can select the appropriate method to solve right-angled triangle problems • I can work with key angles in right-angled triangles **LO3: Representing Solutions of Equations and Inequalities** • I know how to form one-step and two-step equations and inequalities • I know how to show solutions to inequalities on a number line • I know how to draw straight line graphs • I know how to form and solve equations and inequalities with unknowns on both sides • I know how to form and solve more complex equations and inequalities	• I know how to make scale drawings using bearings • I know how to calculate bearings using angle rules • I know how to solve bearing problems using Pythagoras and trigonometry	• I know how to link ratios and scales • I know how to use and interpret ratios in the form 1:n and n:1 • I know how to solve best buy problems • I know how to combine a set of ratios • I know how to link ratio and algebra • I know how to solve mixed ratio problems	• I know how to use experimental data to estimate probabilities • I know how to find probabilities from tables, Venn diagrams and frequency trees • I know how to construct and interpret sample spaces for more than one event • I know how to calculate probability with independent events • I know how to use tree diagrams for independent and dependent events	• I know how to round to decimal places and significant figures • I know how to estimate answers to calculations • I know how to use limits of accuracy • I know how to solve financial maths problems • I know how to break down and solve multi-step problems
National Curriculum reference	Link to Mathematics programme of study: key stage 4 – National curriculum in England: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/331882/KS4_maths_PoS_FINAL_170714.pdf					

Common misconceptions	**LO1: Calculations and Accuracy**
	• Students often incorrectly consider negative numbers with a larger magnitude than positives to have a bigger value. For example, -3 < 2.
	• Common incorrect answers to -4 + 6 are - 2 (4 – 6) and -10 (-4 – 6)
	• Trying to remember multiplication rules for when to leave the answer as a positive or negative often results in confusion when adding and subtracting. Use a number line to demonstrate -3 x 2 = -3 + - 3 = 6.
	• Students incorrectly consider multiplications to always increase a number and divisions to decrease.
	• Students fail to spot incorrect calculations due to not estimating solutions.
	
	LO2: Fractions, Decimals and Percentages
		LO1 Congruence, Similarity and Enlargement
		• Students often struggle with proving congruence. Encourage them to annotate sketch diagrams with clearly marked angles and state the angle properties used.
		• Scale factors are can be incorrectly calculated using different measures, e.g., Area Ã· Length
		• The incorrect scale factor can be applied to calculate an unknown dimension. For instance, students may use the Area scale factor to find a length.
		
		LO2: Trigonometry
		• Students often have difficulty knowing which trigonometric ratio to apply. Encourage them to label the sides to identify the correct ratio clearly.
			LO1: Simultaneous Equations
			• Students often struggle to know when to add or subtract the equations to eliminate the unknown. Review addition with negatives to address this.
			• Equations need to be aligned so that unknowns can be easily added or subtracted. If equations are not aligned students may add or subtract with non like variables.
			• Students often try to eliminate variables with their coefficients being equal
			
			LO2: Angles and Bearings
			• Students often struggle to know when to add or subtract the equations to eliminate the unknown. Review addition with negatives to address this.
			• Equations need to be aligned so that unknowns can be easily added or
				LO1: Working with Circles
				• Students often confuse the area and circumference formulae
				• Students often confuse the different names for the parts of a circle.
				• Students often make rounding errors when approximating solutions. Encourage students to work in terms of pi until the final stage of the question.
				
				LO2: Ratio and Fractions
				• A shape that is split in two is not necessarily split in half. A half must be two equal proportions of a shape.
				• A fraction with a larger denominator has the greater value.
				• A fraction with a smaller denominator has a lesser value.
					LO1: Percentages and Interest
					• Students often consider percentages to be limited to 100%. A key learning point is to understand how percentages can exceed 100%.
					• Students sometimes confuse 70% with a magnitude of 70 rather than 0.7.
					• Students can confuse 65% with 1/65 rather than 65/100.
					• Compound interest is often confused with simple interest, i.e., 10% compound interest = 110% = 1.12, not 220% (2.2).
					
					LO2: Probability
					• Writing probabilities as a ratio is a common misconception.
					• When creating Venn diagrams students often forget to place the remaining events outside the circles.
						LO1: Collecting, Representing and Interpreting Data
						• Bar charts are often drawn with unequal-width bars.
						• Students often use nonlinear scales for bar and line graphs.
						• The frequency is often incorrectly taken as the angle when drawing pie charts.
						• Diagrams are often drawn without the correct labels and missing title
						• Students often have difficulty designing two-way tables.
						• When designing questionnaires common errors include:
						  o No time period
						  o Overlapping responses
						  o Check boxes with unequal widths.
						  o Double negative questions.

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	• A shape that is split in two is not necessarily split in half. A half must be two equal proportions of a shape. • A fraction with a larger denominator has the greater value. • A fraction with a smaller denominator has a lesser value. • Fractions such as 3/5 incorrectly have a decimal equivalence of 3.5. • Students incorrectly consider multiplications to always increase a number and divisions to decrease. • Students fail to spot incorrect calculations due to not estimating solutions. **LO3: Measures** • Students sometimes fail to recognise that imperial and metric units are two distinct sets of measurements. • Remembering the metric/imperial conversions often prove difficult for most students. • Students may have difficulty with the numerical conversions, especially with imperial units. Encourage the use of calculators when appropriate.	• Use SOHCAHTOA as a memory aid as students often forget the trigonometric ratios. • When using trigonometric ratios to calculate angles students often forget to use the inverse functions. • Students often try to apply right-angled formulae to non-right-angled triangles. **LO3: Representing Solutions of Equations and Inequalities** • Students tend not to interpret the less than/greater and equal signs correctly • Confusion often lies in understanding the notation using empty and full circles on a number line. • Students often find it difficult to identify the correct region for linear and quadratic inequalities on a grid. • Students can forget to apply the same operation to both sides of the equation therefore leaving it unbalanced. • Students often struggle knowing when to add or subtract the equations to eliminate the unknown. Review addition with negatives to address this. • Equations need to be aligned so that unknowns can be easily added or subtracted. If equations are not aligned students may add or subtract with non like variables. • Students often try to eliminate variables with their coefficients being equal.	subtracted. If equations are not aligned students may add or subtract with non like variables. • Students often try to eliminate variables with their coefficients being equal	• Fractions such as 3/5 incorrectly have a decimal equivalence of 3.5. • Ratio amounts are often confused with fractions involving the same digits. For instance, 2 : 3 is confused with 2â•„3 or 1 : 2 = 1â•„2. • When solving problems involving proportion students tend to struggle with forming a ratio. For instance, 3 apples cost 45p would form the ratio apples : cost. • When writing ratios into the form 1 : n students incorrectly assume that n has to be an integer or greater than 1.	• When listing permutations of combined events students often repeat events when they do not use a logical and systematic method. • Students often have difficulty completing Venn diagrams involving 3 intersecting circles.	• Students often try to represent continuous data using methods that are only applicable for discrete sets. **LO2: Non-calculator Methods** • Students often define a prime number as a value that divides by 1 and itself. This leads to the incorrect assumption of 1 being a prime number. • When subtracting, students may find knowing when to borrow confusing and instead incorrectly subtract the smaller digit from the larger one. E.g., 43 – 25 = 22 • Aligning the correct value digits for column addition and subtraction can prove troublesome. Encourage the use of the place value table.